

WHAT IS CLAIMED IS:

1. A soft tissue product that has a relatively low level of lint and slough, said tissue product comprising:

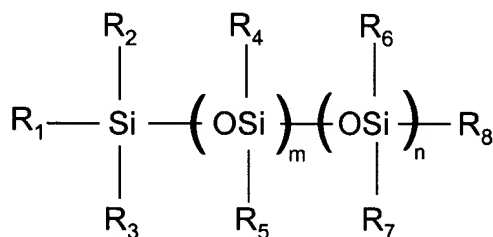
at least one paper web formed from a cellulosic fibrous material;

and

a flexible binder applied to said paper web, said flexible binder being a copolymer formed from at least the following monomeric constituents:

a) an ethylenically unsaturated monomeric constituent containing one or more ethylenically unsaturated monomers; and

b) an unsaturated polysiloxane monomeric constituent containing one or more unsaturated polysiloxane monomers, wherein said unsaturated polysiloxane monomeric constituent contains at least one unsaturated polysiloxane monomer having the following formula:



wherein,

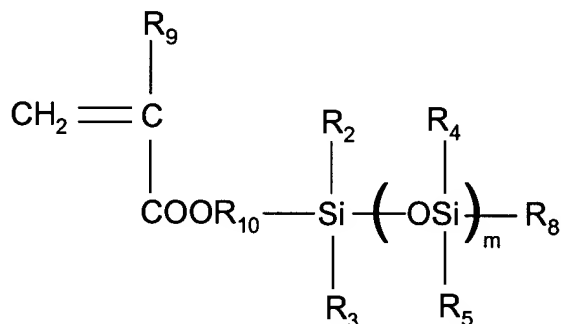
R₁ is an ethylenically unsaturated group that has free radical polymerizability; and

R₂, R₃, R₄, R₅, R₆, R₇, and R₈ are the same or different, and are selected from the group consisting of hydrogen, an aryl group, an alkyl group, a substituted alkyl or aryl group, an ethoxy group, and a propoxy group;

m is an integer from 4 to 15,000; and

n is an integer from 0 to 15,000.

2. A tissue product as defined in claim 1, wherein said unsaturated polysiloxane monomeric constituent contains at least one unsaturated polysiloxane monomer having the following formula:



wherein,

R₂, R₃, R₄, R₅, and R₈ are the same or different, and are selected from the group consisting of hydrogen; an aryl group; an alkyl group; a substituted alkyl or aryl group; an ethoxy group; a propoxy group; and an amino group;

R₉ is hydrogen or a C₁-C₄ alkyl group;

R₁₀ is a C₁-C₄ alkyl or a C₁-C₄ alkylene group; and

m is between 4 to 500.

3. A tissue product as defined in claim 2, wherein R₁₀ is a C₃ alkylene having the formula, C₃H₆.

4. A tissue product as defined in claim 1, wherein said ethylenically unsaturated monomeric constituent includes at least one hydrophilic ethylenically unsaturated monomer.

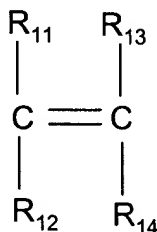
5. A tissue product as defined in claim 4, wherein said hydrophilic ethylenically unsaturated monomer is cationic.

6. A tissue product as defined in claim 1, wherein said ethylenically

unsaturated monomeric constituent includes at least one ethylenically unsaturated monomer selected from the group consisting of acrylic acid, methacrylic acid, derivatives of acrylic acid, derivatives of methacrylic acid, and combinations thereof.

5 7. A tissue product as defined in claim 1, wherein said ethylenically monomeric constituent includes at least two ethylenically unsaturated monomers.

8. A tissue product as defined in claim 7, wherein one of said ethylenically unsaturated monomers has the following formula:



wherein,

R_{11} , R_{12} , and R_{13} are the same or different, and are selected from the group consisting of hydrogen and a C_1 - C_4 alkyl group; and

15 R_{14} is a hydrophobic group.

9. A tissue product as defined in claim 8, wherein R_{14} is an acrylic- or methacrylic-based ester having an alkyl chain length of C_1 - C_{40} .

10. A tissue product as defined in claim 1, wherein said ethylenically unsaturated monomeric constituent forms greater than about 15% by weight of the total monomer weight of said copolymer.

20 11. A tissue product as defined in claim 1, wherein said polysiloxane unsaturated monomeric constituent forms between 0.1% to about 85% by weight of the total monomer weight of said copolymer.

12. A tissue product as defined in claim 1, wherein said

polysiloxane unsaturated monomeric constituent forms between about 0.5% to about 70% by weight of the total monomer weight of said copolymer.

13. A tissue product as defined in claim 1, wherein said polysiloxane unsaturated monomeric constituent forms between about 0.5% to about 20% by weight of the total monomer weight of said copolymer.

14. A tissue product as defined in claim 1, wherein the basis weight of said tissue product is less than about 120 grams per square meter.

15. A tissue product as defined in claim 1, wherein the basis weight of said tissue product is less than about 70 grams per square meter.

16. A tissue product as defined in claim 1, wherein the amount of total binder applied to said paper web is between about 0.02% to about 5% by weight of total fiber within said web.

17. A tissue product as defined in claim 1, wherein the amount of total binder applied to said paper web is between about 0.05% to about 3% by weight of total fiber within said web.

18. A tissue product as defined in claim 1, wherein the amount of total binder applied to said paper web is between about 0.1% to about 2% by weight of total fiber within said web.

19. A soft tissue product having a basis weight less than about 120 grams per square meter and having a relatively low level of lint and slough, said tissue product comprising:

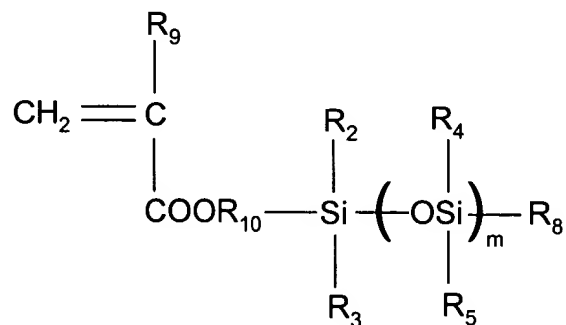
at least one paper web formed from a cellulosic fibrous material;
and

a flexible binder applied to said paper web in an amount between

about 0.02% to about 5% by weight of total fiber within said web, said flexible binder being a copolymer formed from at least the following monomeric constituents:

5 a) an ethylenically unsaturated monomeric constituent containing one or more ethylenically unsaturated monomers, said ethylenically unsaturated monomeric constituent forming greater than about 15% by weight of the total monomer weight of said copolymer, wherein said ethylenically monomeric constituent contains at least one ethylenically unsaturated monomer selected from the group consisting of
10 acrylic acid, methacrylic acid, derivatives of acrylic acid, derivatives of methacrylic acid, and combinations thereof;

b) an unsaturated polysiloxane monomeric constituent containing one or more unsaturated polysiloxane monomers, said unsaturated polysiloxane monomeric constituent forming between about 0.1% to about 85% by weight of the total monomer weight of said
15 copolymer, wherein said unsaturated polysiloxane monomeric constituent contains at least one unsaturated polysiloxane monomer having the following formula:



wherein,

R₂, R₃, R₄, R₅, and R₈ are the same or different, and are selected

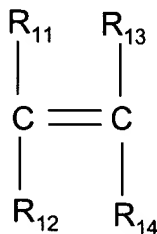
from the group consisting of hydrogen, an aryl group, an alkyl group, a substituted alkyl or aryl group, an ethoxy group, a propoxy group, and an amino group;

R₉ is hydrogen or a C₁-C₄ alkyl group;

5 R₁₀ is a C₁-C₄ alkyl or a C₁-C₄ alkylene group; and
m is between 4 to 500.

20. A tissue product as defined in claim 19, wherein R₁₀ is a C₃ alkylene having the formula, C₃H₆.

10 21. A tissue product as defined in claim 19, wherein said
ethylenically monomeric constituent includes at least two ethylenically unsaturated monomers, wherein one of said ethylenically unsaturated monomers has the following formula:



15 wherein,

R₁₁, R₁₂, and R₁₃ are the same or different, and are selected from the group consisting of hydrogen and a C₁-C₄ alkyl group; and

R₁₄ is a hydrophobic group.

20 22. A tissue product as defined in claim 21, wherein R₁₄ is an
acrylic- or methacrylic-based ester having an alkyl chain length of C₁-C₄₀.

23. A tissue product as defined in claim 19, wherein said polysiloxane unsaturated monomeric constituent forms between 0.1% to about 85% by weight of the total monomer weight of said copolymer.

24. A tissue product as defined in claim 19, wherein said

polysiloxane unsaturated monomeric constituent forms between about 0.5% to about 70% by weight of the total monomer weight of said copolymer.

25. A tissue product as defined in claim 19, wherein said polysiloxane unsaturated monomeric constituent forms between about 0.5% to about 20% by weight of the total monomer weight of said copolymer.

26. A tissue product as defined in claim 19, wherein said ethylenically unsaturated monomeric constituent includes at least one hydrophilic ethylenically unsaturated monomer.

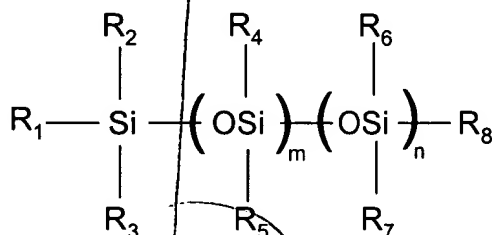
27. A tissue product as defined in claim 26, wherein said hydrophilic ethylenically unsaturated monomer is cationic.

28. A method of forming a tissue product comprising:
providing a papermaking furnish containing cellulosic fibers;
depositing said papermaking furnish onto a forming surface to form a relatively wet paper web;
drying said relatively wet paper web; and
applying a flexible binder to said papermaking furnish, said relatively wet paper web, said dried paper web, or combinations thereof, wherein said flexible binder is a copolymer formed from at least the following monomeric constituents:

a) an ethylenically unsaturated monomeric constituent containing one or more ethylenically unsaturated monomers, said ethylenically unsaturated monomeric constituent forming greater than about 15% by weight of the total monomer weight of said copolymer, wherein said ethylenically monomeric constituent contains at least one ethylenically unsaturated monomer selected from the group consisting of acrylic acid, methacrylic acid, derivatives of acrylic acid, derivatives of

methacrylic acid, and combinations thereof;

b) an unsaturated polysiloxane monomeric constituent containing one or more unsaturated polysiloxane monomers, said unsaturated polysiloxane monomeric constituent forming between about 0.1% to about 85% by weight of the total monomer weight of said copolymer, wherein said unsaturated polysiloxane monomeric constituent contains at least one unsaturated polysiloxane monomer having the following formula:



wherein,

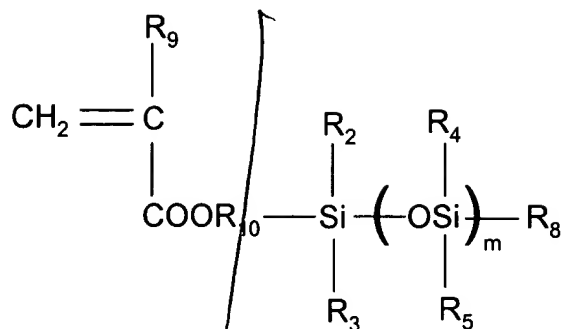
R_1 is an ethylenically unsaturated group that has free radical polymerizability; and

R_2 , R_3 , R_4 , R_5 , R_6 , R_7 , and R_8 are the same or different, and are selected from the group consisting of hydrogen, an aryl group, an alkyl group, a substituted alkyl or aryl group, an ethoxy group, and a propoxy group;

m is an integer from 4 to 15,000; and

n is an integer from 0 to 15,000.

29. A method as defined in claim 28, wherein said unsaturated polysiloxane constituent contains at least one unsaturated polysiloxane monomer having the following formula:



wherein,

R₂, R₃, R₄, R₅, and R₈ are the same or different, and are selected from the group consisting of hydrogen; an aryl group; an alkyl group; a substituted alkyl or aryl group; an ethoxy group; a propoxy group; and an amino group;

R₉ is hydrogen or a C₁-C₄ alkyl group;

R₁₀ is a C₁-C₄ alkyl or a C₁-C₄ alkylene group; and

m is between 4 to 500.

30. A method as defined in claim 29, wherein R₁₀ is a C₃ alkylene having the formula, C₃H₆.

31. A method as defined in claim 28, wherein said ethylenically unsaturated monomeric constituent contains at least one ethylenically unsaturated monomer that is hydrophilic.

32. A method as defined in claim 31, wherein said hydrophilic ethylenically unsaturated monomer is cationic.

33. A method as defined in claim 28, wherein said polysiloxane unsaturated monomeric constituent forms between 0.1% to about 85% by weight of the total monomer weight of said copolymer.

34. A method as defined in claim 28, wherein said polysiloxane unsaturated monomeric constituent forms between about 0.5% to about 70% by weight of the total monomer weight of said copolymer.

